NO MORE PEANUT ROULETTE!

It's a classic word problem in math: You have a jar full of white marbles plus a blue one, and you're handing out cups full of marbles. What are a person's chances of getting the blue one?

Let's make it more interesting. Make the "blue marble" a peanut contaminated with aflatoxin—a known carcinogen regulated by the Food and Drug Administration (FDA). Overestimate, and some farmers unfairly lose profits; underestimate, and some handlers may lose profit or consumers may be at risk.

Still want to try and figure this out?

As it turns out, agricultural engineer Thomas B. Whitaker, who is with the Agricultural Research Service, has made a career out of developing methods to accurately estimate aflatoxin contamination in peanut lots so that appropriate handling occurs. His sampling methods have been relied on by the FDA, USDA, and the peanut industry.

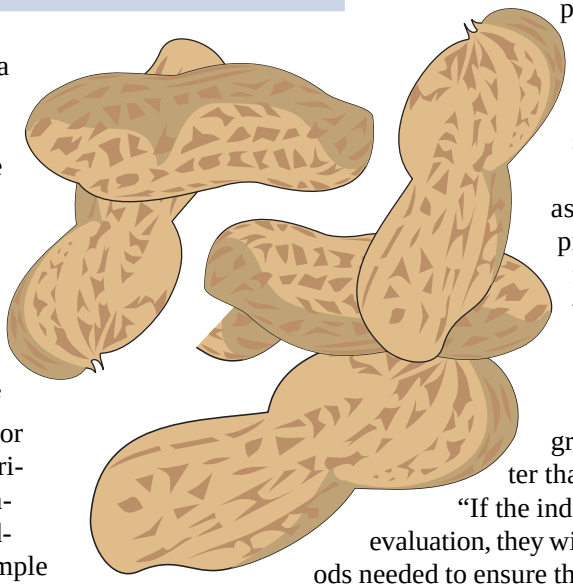
Mathematical ratio predicts aflatoxin contamination.

Recent research findings may help both shellers and growers reduce losses while preserving quality.

When a farmer brings a truckload of peanuts to the buying point, or sheller, for processing, a grader with USDA's Agricultural Marketing Service takes a random sample from the load. Another grader looks through a 1-pound peanut sample for moldy kernels that could possibly indicate contamination from the aflatoxin-producing *Aspergillus flavus* fungus.

One moldy kernel is enough to divert an entire truckload to a low-grade bin—and to potentially reduced grower profits. Federal price supports are also linked to this quality assessment.

If a contaminated kernel is found, the load can be re-evaluated—after the entire lot is screened to remove foreign material, loose-shelled kernels, and small pods. But even then, a moldy kernel can condemn the truckload.



Is There a Better Way?

"Shellers have long known that damaged, loose-shelled, or small kernels are more likely to be contaminated with aflatoxin," says Whitaker. "Contamination levels in these subgroups bear a statistical relationship to levels in the entire lot. Shellers just needed an accurate estimate of the aflatoxin ratio."

Whitaker determined that ratio: It's five to one. That is, if a sample of high-risk peanuts from a lot has an aflatoxin contamination level of 100 parts per billion (ppb), the truckload will probably average 20 ppb—the FDA's legal limit for food quality safety.

This aflatoxin ratio method might be used to replace or complement visual analysis. It could uncover some lots possessing more contamination than meets the eye, while protecting growers from big losses based on one or two unlucky draws. Measuring aflatoxin in high-risk peanuts provides a more accurate estimate of aflatoxin contamination than the current visual method.

Whitaker came to his conclusion by taking 2,400 samples from 120 lots. For each lot, he took five samples and separated them into groups: sound, mature kernels and sound splits; damaged kernels; loose-shelled kernels; and small kernels.

Using a mathematical method known as regression analysis, he developed prediction models relating aflatoxin from the at-risk product to aflatoxin in the entire lot.

Some shellers informally experiment with this kind of analysis. But to establish a standard, the peanut grading service needed something better than guesswork.

"If the industry decides to formalize this kind of evaluation, they will already have the mathematical methods needed to ensure they predict aflatoxin more accurately," says Whitaker. The research was published in the fall 1998 issue of the *Journal of the Association of Official Analytical Chemists International*.—By **Jill Lee,** formerly with ARS.

This research is part of Integrated Crop Production and Protection Systems, an ARS National Program described on the World Wide Web at http://www.nps.ars.usda.gov/programs/cppvs.htm.

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